

WHAT IS CLAIMED IS:

1. 1. A method of treating a disc plate, the method comprising the following operations of:
 3. molding a mold disc plate through an injection molding; and
 4. spinning the mold disc plate at a high spin speed, the spinning operation comprising at least one of the following two sub-operations of:
 6. reducing a warp of the mold disc plate with a centrifugal force caused during the spinning operation, and
 8. reducing a temperature of the mold disc plate during the spinning operation.
1. 2. The method of treating the disc plate as claimed in claim 1, in which the mold disc plate is subjected to the spinning operation before the mold disc plate is solidified; and
4. the mold disc plate is stopped from spinning after the mold disc plate is solidified.
1. 3. The method of treating the disc plate as claimed in claim 1, in which the mold disc plate is subjected to the spinning operation at the temperature of the mold disc plate higher than 90° C; and
4. the mold disc plate is stopped from spinning after a temperature of material of the mold disc plate is reduced to not higher than 90° C.
1. 4. The method of treating the disc plate as claimed in claim 1, in which a speed of spinning the mold disc plate is not lower than 3,000 rpm.
1. 5. The method of treating the disc plate as claimed in claim 4, in which the speed of spinning the mold disc plate is not lower than 4,000 rpm.
1. 6. The method of treating the disc plate as claimed in claim 1, in which the mold disc plate takes one of a cooling operation and a heating operation, at a time one of the following two:

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4 before spinning the mold disc plate, and
5 during spinning the mold disc plate.

1 7. The method of treating the disc plate as claimed in claim 1, in which
2 the mold disc plate becomes the disc plate at not higher than 90° C;
3 the method further comprises a warp measuring operation of measuring the
4 warp of the disc plate when the temperature of the mold disc plate is reduced to not
5 higher than 90° C; and

6 the warp of the disc plate measured through the warp measuring operation is a
7 criterion for adjusting one of the following two of the mold disc plate:
8 one of a spin speed, a spin time and a spin speed rise time, and
9 a combination of the spin speed, the spin time and the spin speed rise
10 time.

1 8. The method of treating the disc plate as claimed in claim 1, in which
2 the method further comprises a temperature measuring operation of measuring
3 the temperature of the mold disc plate, at a time one of the following two:

4 before spinning the mold disc plate, and
5 during spinning the mold disc plate; and
6 the temperature of the mold disc plate measured through the temperature
7 measuring operation is a criterion for adjusting one of the following two of the mold
8 disc plate:

9 one of a spin speed, a spin time and a spin speed rise time, and
10 a combination of the spin speed, the spin time and the spin speed rise
11 time.

1 9. The method of treating the disc plate as claimed in claim 1, in which
2 the temperature of the mold disc plate is measured, at a time one of the
3 following two:

4 before spinning the mold disc plate, and
5 during spinning the mold disc plate; and
6 the measured temperature is a criterion for selecting one of a cooling operation
7 and a heating operation of the mold disc plate.

1 10. The method of treating the disc plate as claimed in claim 1, in which
2 the mold disc plate becomes the disc plate at not higher than 90° C;
3 the method further comprises a warp measuring operation of measuring the
4 warp of the disc plate when the temperature of the mold disc plate is reduced to not
5 higher than 90° C; and
6 the warp of the disc plate measured through the warp measuring operation is a
7 criterion for adjusting one of a cooling operation and a heating operation of the mold
8 disc plate, at a time one of the following two:
9 before spinning the mold disc plate, and
10 during spinning the mold disc plate.

1 11. The method of treating the disc plate as claimed in claim 9, in which an air
2 flow having a temperature of one of not higher than 90° C and higher than 90° C is
3 blown radially outward along a first surface and a second surface of the mold disc
4 plate from an area defining a hole substantially in a center of the mold disc plate, at
5 the time one of the following two:
6 before spinning the mold disc plate, and
7 during spinning the mold disc plate.

1 12. The method of treating the disc plate as claimed in claim 11, in which the air
2 flow along each of the first surface and the second surface of the mold disc plate is
3 adjusted in respect of at least one of a speed and a temperature.

1 13. The method of treating the disc plate as claimed in claim 9, in which
2 an air flow having a temperature of one of not higher than 90° C and higher
3 than 90° C is blown from an upper area above substantially a center area of the mold
4 disc plate, at the time one of the following two:
5 before spinning the mold disc plate, and
6 during spinning the mold disc plate; and
7 the air flow flows radially outward along a first surface of the mold disc plate.

1 14. The method of treating the disc plate as claimed in claim 9, in which an air
2 flow is absorbed from an external surface of the mold disc plate, at the time one of
3 the following two:

4 before spinning the mold disc plate, and
5 during spinning the mold disc plate.

1 15. An apparatus of treating a disc plate, the apparatus comprising:
2 a conveyer for conveying a mold disc plate obtained through an injection
3 molding;
4 a disc bench for receiving the mold disc plate conveyed with the conveyer; and
5 a spin driver for spinning the disc bench when a temperature of the mold disc
6 plate is higher than 90° C, to thereby spin the mold disc plate.

1 16. The apparatus of treating the disc plate as claimed in claim 15,
2 in which the mold disc plate becomes the disc plate at not higher than 90° C;
3 and
4 in which the apparatus further comprises:

5 a warp measuring device for measuring a warp of the disc plate when the
6 temperature of the mold disc plate is reduced to not higher than 90° C; and
7 a converter-controller for converting and controlling a datum, the
8 converter-controller taking the following operations of:

9 analyzing the warp of the disc plate,
10 determining one of the following two of the mold disc plate, in
11 accordance with a dimension of the analyzed warp of the disc plate:
12 one of a spin speed, a spin time and a spin speed rise time,
13 and

14 a combination of the spin speed, the spin time and the spin
15 speed rise time, and
16 transmitting a control signal to the spin driver, the control signal
17 controlling one of the following two of the mold disc plate:
18 one of the spin speed, the spin time and the spin speed rise
19 time, and

the combination of the spin speed, the spin time and the spin speed rise time.

17. The apparatus of treating the disc plate as claimed in claim 15,
in which the apparatus further comprises:
 - 1 a temperature measuring device for measuring the temperature of the
mold disc plate when the mold disc plate is in a spinning operation; and
2 a converter-controller for converting and controlling a datum, the
converter-controller transmitting a control signal to the spin driver, the control signal
controlling one of the following two of the mold disc plate:
 - 3 one of a spin speed, a spin time and a spin speed rise time, and
4 a combination of the spin speed, the spin time and the spin speed
rise time; and
5 in which the converter-controller converts and controls the datum from the
following two of the mold disc plate:
 - 6 the temperature measured with the temperature measuring device, and
7 a data base on a predetermined relation between a temperature stored in
the data base, and the following three stored in the data base:
 - 8 the spin speed, the spin time and the spin speed rise time.

1 18. The apparatus of treating the disc plate as claimed in claim 15, in which the
2 apparatus further comprises:

3 a cooler for cooling the mold disc plate; and
4 a heater for heating the mold disc plate.

1 19. The apparatus of treating the disc plate as claimed in claim 15,
2 in which the mold disc plate becomes the disc plate at not higher than 90° C;
3 in which the apparatus further comprises:

4 a warp measuring device for measuring a warp of the mold disc plate
5 when the mold disc plate is reduced to not higher than 90° C, and
6 one of the following two:

7 a cooler for cooling the mold disc plate based on the warp
8 measured with the warp measuring device, and

9 a heater for heating the mold disc plate based on the warp measured
10 with the warp measuring device; and

11 in which the apparatus adjusts the temperature of the mold disc plate through
12 one of the cooling operation with the cooler and the heating operation with the
13 heater.

1 20. The apparatus of treating the disc plate as claimed in claim 15,
2 in which the mold disc plate becomes the disc plate at not higher than 90° C;
3 in which the apparatus further comprises:

4 a temperature measuring device for measuring the temperature of the
5 mold disc plate when the mold disc plate is reduced to not higher than 90° C, and
6 one of the following two:

7 a cooler for cooling the mold disc plate based on the temperature
8 measured with the temperature measuring device, and

9 a heater for heating the mold disc plate based on the temperature
10 measured with the temperature measuring device;

11 in which the cooling operation and the heating operation of the mold disc plate
12 are carried out at a time one of the following two:

13 before spinning the mold disc plate, and
14 during spinning the mold disc plate; and

15 in which the apparatus adjusts the temperature of the mold disc plate through
16 one of the cooling operation with the cooler and the heating operation with the
17 heater.

1 21. The apparatus of treating the disc plate as claimed in claim 18, in which
2 the cooler blows out an air flow not higher than 90° C, and the heater blows
3 out an air flow higher than 90° C; and
4 the air flow from the cooler and the air flow from the heater are blown out
5 radially outward along a first surface and a second surface of the mold disc plate, by
6 way of an air flow passage disposed in a spin shaft member of the disc bench.

1 22. The apparatus of treating the disc plate as claimed in claim 21, in which the
2 apparatus adjusts at least one of a speed and a temperature of the air flow along each
3 of the first surface and the second surface of the mold disc plate.

1 23. The apparatus of treating the disc plate as claimed in claim 18, in which
2 each of the cooler and the heater has an absorption mechanism formed with
3 substantially a circular opening having an internal diameter larger than an external
4 diameter of the mold disc plate;

5 the circular opening is disposed along an external circumference of the mold
6 disc plate; and

7 the absorption mechanism absorbs an air flow from the external circumference
8 of the mold disc plate through the circular opening.

1 24. The apparatus of treating the disc plate as claimed in claim 18, in which
2 the cooler blows out an air flow not higher than 90° C, and the heater blows
3 out an air flow higher than 90° C; and
4 each of the cooler and the heater is constituted of an absorber pad for fixedly
5 absorbing the mold disc plate.

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